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<sup>(12)</sup> UK Patent Application <sup>(19)</sup> GB <sup>(11)</sup> 2 337 857 <sup>(13)</sup> A

(43) Date of A Publication 01.12.1999

**(21) Application No 9902526.4**

(22) Date of Filing 04.02.1999

(31) 10041428 (32) 06.02.1998 (33) JP

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**H01H 13/10 13/70 // H04M 1/02**

H1N NBH N61X N616 N618 N625 N626 N649 N654  
N664 N747 N805 N854  
H4J JK J36Q  
U1S S2215

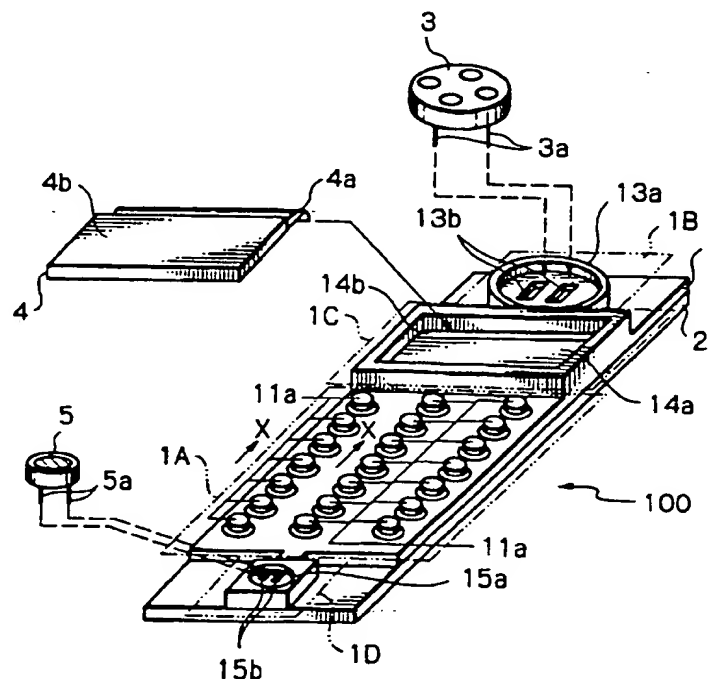
WO 85/03595 A1    US 5386084 A    US 3798639 A

UK CL (Edition Q ) H1N NAX NBG NBH  
INT CL<sup>6</sup> H01H

### Mounting structure

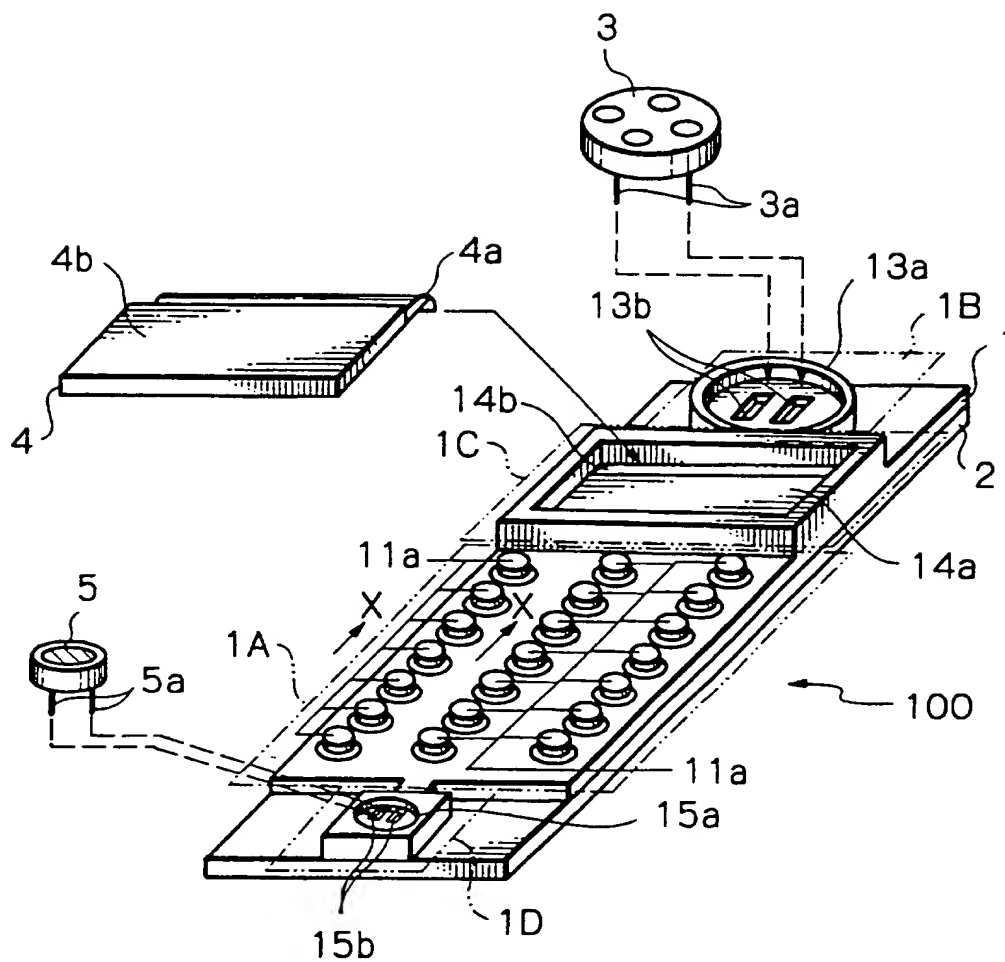
(57) A mounting structure for an electronic apparatus includes a single holder 1 including a key sheet portion 1A to be mounted on a circuit board 2 and a plurality of holder portions 1A, 1B, 1C, 1D each for holding a particular electronic part. The mounting structure reduces the number of parts to be mounted to the circuit board and thereby enhances efficient assembly.

*Fig. 1*



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

*Fig. 1*

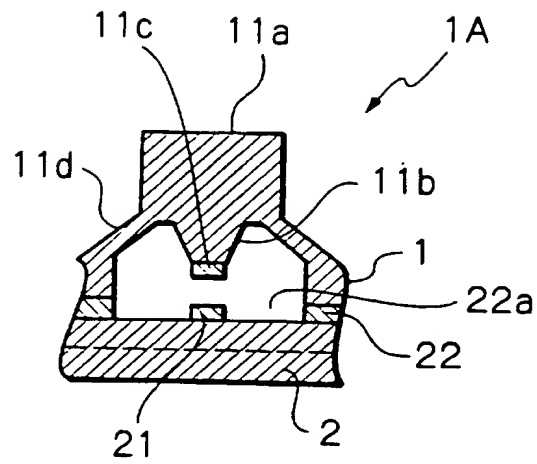
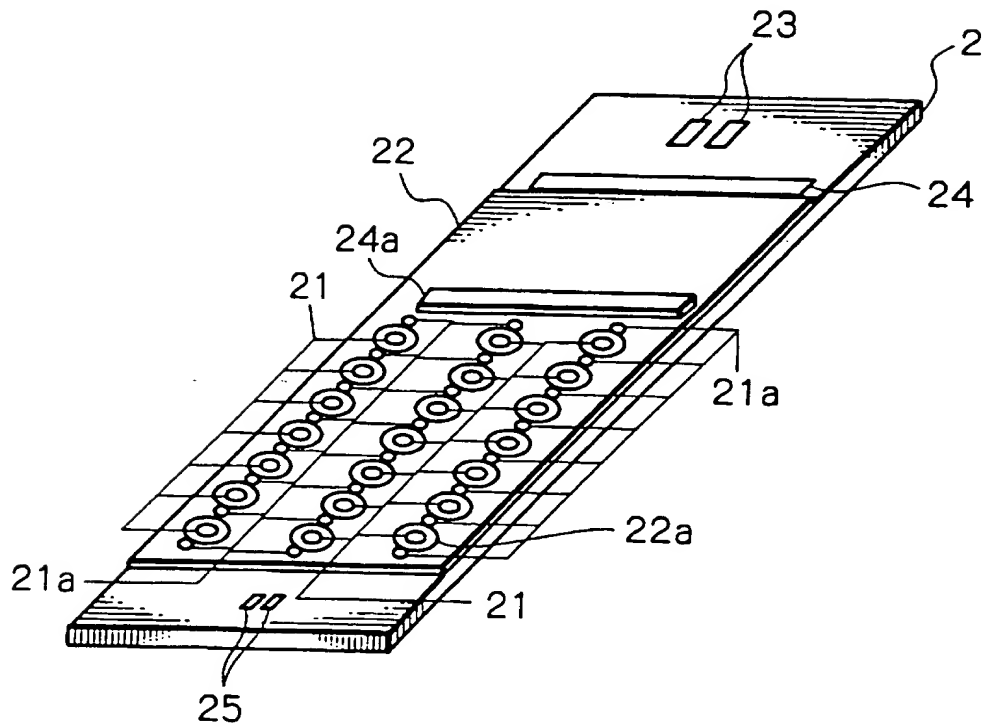
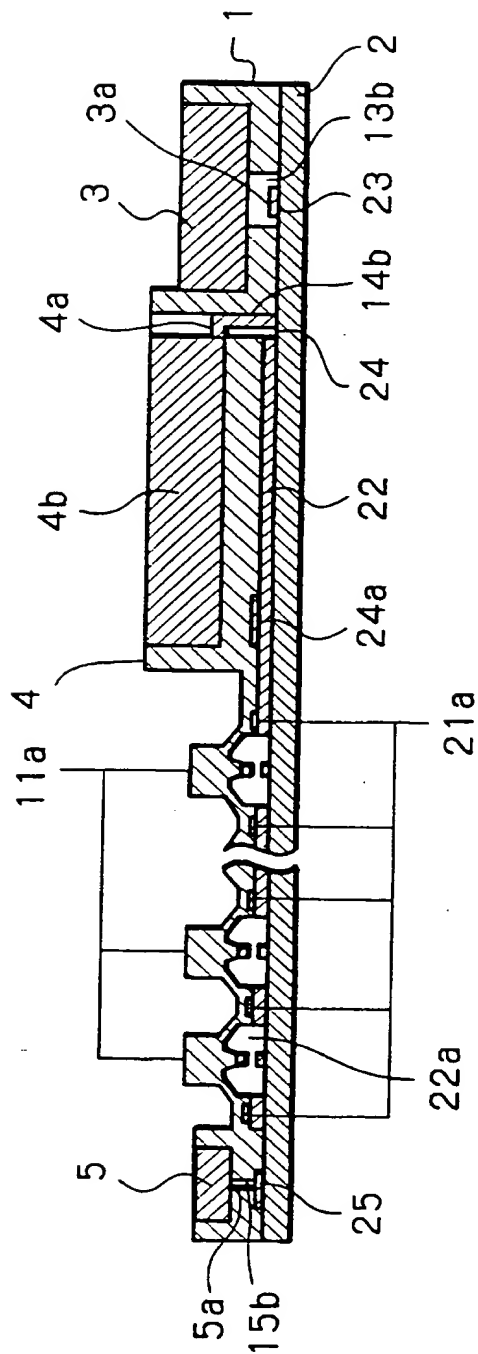
*Fig. 2**Fig. 3*



Fig. 5



## MOUNTING STRUCTURE FOR AN ELECTRONIC APPARATUS

## BACKGROUND OF THE INVENTION

The present invention relates to a mounting structure for a handy phone or similar electronic apparatus.

5 A handy phone, for example, includes a receiver, a display, a transmitter and other various electronic parts mounted on a circuit board. Such electronic parts are, in many cases, set in respective holders and then mounted to the circuit board together with the holders. Stationary contacts are arranged on the top of the circuit board. It is a common practice to mount on the top of the circuit  
10 board a key sheet including movable contacts corresponding one-to-one to the stationary contacts. The movable contacts each is movable into and out of contact with associated one of the stationary contact, serving as a key switch for selectively establishing or interrupting electrical connection.

15 The problem with the above conventional structure is that it is necessary to set each of the various electronic parts in the respective holder and then mount such holders to the circuit board one by one. This kind of assembly is time- and labor-consuming because the handy phone includes a number of parts and because the  
20 key sheet must be mounted to the circuit board with its movable contact

accurately aligned with the stationary contacts.

Technologies relating to the present invention are disclosed in, e.g., Japanese Patent Laid-Open Publication No. 4-235443.

### SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a mounting structure for an electronic apparatus capable of reducing the number of holders and promoting efficiency assembly.

The present invention provides a device for holding one or more components of an electronic apparatus, said device comprising component receiving means for receiving said one or more components; and a plurality of movable keys for contacting respective contacts formed on a circuit board.

A preferred embodiment of the present invention provides a structure for mounting a plurality of electronic parts for constituting an electronic apparatus to a circuit board via respective holders. The circuit board includes a plurality of stationary contacts arranged on the circuit board. A key sheet is mounted on the circuit board and includes movable contacts each being movable into and out of contact with a respective one of the stationary contacts. A holder includes a key sheet portion constituting the key sheet and a plurality of holder portions each constituting particular one of the holders.

### BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description taken with the accompanying drawings in which:

Fig.1 is an exploded perspective view showing a mounting structure embodying the present invention and applied to a handy phone by way of example;



FIG. 2 is a section along line X-X of FIG. 1;

FIG. 3 is a perspective view of a circuit board shown in FIGS. 1 and 2;

FIG. 4 is a perspective view showing the handy phone in an assembled condition; and

FIG. 5 is a section along line Y-Y of FIG. 4.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawings, a mounting structure for an electronic apparatus embodying the present invention is shown and applied to a handy phone by way of example. As shown, the handy phone, generally 100, includes a circuit board 2. A receiver or speaker 3, a display 4 and a transmitter or microphone 5 are electrically connected to the circuit board 2 via a holder 1. The receiver 3, display 4 and transmitter 5 are electronic parts included in the handy phone 100.

The holder 1 is formed of an elastic material transparent for light and made up of a key sheet portion 1A, a first holder portion 1B, a second holder portion 1C, and a third holder portion 1D. Key tops 11a are arranged in the key sheet portion 1A in three parallel arrays extending in the lengthwise direction of the circuit board 2.

As shown in FIG. 2, each key top 11a has a projection 11b on its bottom or back and a movable contact 11c fitted on the projection 11b. The key top 11a is flared downward, forming a skirt portion 11d. A light-conductive plate 22, which will be described later

specifically, is mounted on the top of the circuit board 2. The key sheet portion 1A is positioned on the top of the light-conductive plate 22. A stationary contact 21 is positioned on the circuit board 2. The light-conductive plate 22 is formed with a hole 22a, so that the movable contact 11c can contact the stationary contact 21 via the hole 22a when the key top 11a is pushed down by the operator. When the operator releases the key top 11a, it is restored to its original position due to the elasticity of the skirt portion 11d. In this sense, the movable contact 11c of the key top 11a constitute a key switch in cooperation with the stationary contact 21.

The key sheet portion 1A includes numeral keys for inputting numerals "0" through "9", a call origination key, an off-hook key and an on-hook key as well as other conventional keys.

Referring again to FIG. 1, the first holder portion 1B includes a first recess 13a and two first openings 13b formed in the bottom of the first recess 13a. The recess 13a receives the lower portion of the receiver 3 having a flat cylindrical configuration. Two first conductors 3a extend downward from the bottom of the receiver 3 and are connected to the circuit board 2 via the two openings 13b, respectively.

The second holder portion 1C includes a second recess 14a for receiving the flat display 4 having an elongate configuration as viewed in a top plan view. A second opening 14b is formed in the bottom of the recess 14a. A second conductor 4a extends downward from one of opposite longer sides of the display 4 and is connected to the

circuit board 2 via the opening 14b. The display 4 is often implemented by an LCD (Liquid Crystal Display).

The third holder 1D includes a third recess 15a for receiving the lower portion of the flat transmitter 5 having a cylindrical configuration slightly smaller than the receiver 3. Two third openings 15b are formed in the bottom of the recess 15a. Two third conductors 5a extend downward from the bottom of the transmitter 5 and are connected to the circuit board 2 via the two openings 15b, respectively.

The first holder portion 1B, second holder portion 1C, key sheet portion 1A and third holder portion 1D having the above configurations are linearly arranged in this order in the lengthwise direction of the circuit board 1.

As shown in FIG. 3, the circuit board 2 has first stationary contacts 23, a second stationary contact 24 and third stationary contacts 25 arranged on its top. The first stationary contacts 23 are electrically connected to the first conductors 3a of the receiver 3. The second stationary contact 24 is electrically connected to the second conductor 4a of the display 4. The third stationary contacts 25 are electrically connected to the third conductors 5a of the transmitter 5.

The stationary contacts 21 (see FIG. 2 also) are arranged on the top of the circuit board 2 in one-to-one correspondence to the movable contacts 11c (see FIG. 2 also) of the key sheet portion 1A. Each movable contact 11c is electrically connected to the circuit

board 2 via the respective stationary contact 21 when pushed down, as stated earlier.

The flat light-conductive plate 22 mentioned previously is elongate, as seen in a top plan view, and mounted on the top of the circuit board 2. The light-conductive plate 22 extends over the back of the display 4 and that of the key sheet portion 1A. The plate 22 is formed with the openings 22a, one of which is shown in FIG. 2, for allowing the movable contacts 11c to contact the associated stationary contacts 21, as stated earlier.

A strip-like first light source 24a is positioned on the top of the light-conductive plate 22 for lighting a display portion 4b included in the display 4b (see FIG. 1). The first light source 24a extends along the other longer side of the display 4 opposite to the second conductor 4a. Second light sources 21a each is positioned in the vicinity of one of the key tops 11a for lighting the associated key top 11a. Light issuing from the first light source 24a is guided to the display portion 4b via the light-conductive plate 22 and second holder portion 1C accommodating the display 4. Light issuing from any one of the second light sources 21a is guided to the associated key top 11a via the light-conductive plate 22 and key sheet portion 1A.

The handy phone 100 is assembled by the following procedure. First, as shown in FIG. 1, the holder 1 is laid on the circuit board 2 shown in FIG. 3. At this instant, the holder 1 is positioned such that the movable contacts 11c of the key tops 11a are respectively

positioned above the stationary contacts 21, and such that the first openings 13b, second opening 14b and third openings 15b respectively align with the first stationary contacts 23, second stationary contact 24, and third stationary contacts 25.

5           Subsequently, the first conductors 3a of the receiver 3, the second conductor 4a of the display 4 and the third conductors 5a of the transmitter 5 are inserted into the first openings 13b, second opening 14b, and third openings 15b, respectively. Then, the conductors 3a, 4a and 5a are electrically connected to the associated  
10           stationary contacts 23, 24 and 25, respectively.

          After the above electrical connection, the receiver 3, display 4 and transmitter 5 are set in the first holder portion 1B, second holder portion 1C and third holder portion 1D, respectively. FIG. 4 shows the resulting assembly of the handy phone 100.

15           Referring again to FIG. 2, when the operator of the handy phone 100 pushes down any one of the key tops 11a, the movable contact 11c positioned on the projection 11b of the key top 11a is brought into contact with the stationary contact positioned below the movable contact 11c. When the operator releases the above key top 11a, the  
20           key top 11a returns to its original position due to the elasticity of the skirt portion 11d, releasing the movable contact 11c from the stationary contact 21.

          How the display 4b and key tops 11a are lighted is as follows. As shown in FIG. 5, when the first light source 24a mounted on the  
25           circuit board 2 issues light, the light is propagated through the

light-conductive plate 22 and second holder 1c to the display portion 4b of the display 4. Because the light is transmitted through the display portion 4b, the display portion 4b appears bright. When any one of the second light sources 21a also mounted on the circuit board 2 issues light, the light is propagated through the light-conductive plate 22 and key sheet portion 1A to the associated key top 11a, lighting the key top 11a.

As stated above, in the illustrative embodiment, the key sheet portion 1A to be mounted on the substrate and the first to third holder portions 1B-1D for accommodating the receiver 3, display 4 and transmitter 5 are implemented as a single holder 1. This significantly reduces the number of parts of the handy phone 100 and therefore promotes efficient assembly.

In the above embodiment, the holder 1 is formed of a single material, i.e., an elastic material transparent for light. Alternatively, each of the portions 1A-1D may be formed of a particular material so long as the portions 1A-1D can be implemented as a single molding. For example, for the key sheet portion 1A, use may be made of a material elastic enough for the key tops 11a to be pressed and restored and capable of conducting light reached it from the second light sources 21a via the light-conductive plate 22 to the corresponding key tops 11a. Also, the first and third holder portions 1B and 1D may be formed of materials respectively matching with the acoustic characteristics of the receiver 3 and transmitter 5, thereby enhancing speech quality. Further, for the second holder

portion 1C, use may be made of a material transparent for light for conducting light issuing from the first light source 24a to the display portion 4b of the display 4.

The above portions 1A-1D molded integrally to constitute the holder 2 and formed of different materials are desirable from the efficient assembly standpoint. In addition, each of the portions 1A-1D can be formed of a particular optimal material matching with its expected function. Of course, the portions 1A-1D may be formed of different materials independently of each other and then molded integrally to complete holder 2.

While the illustrative embodiment has concentrated on a handy phone, the present invention is similarly applicable to various kinds of electronic apparatuses, particularly of the type including a circuit board having a plurality of stationary contacts, a key sheet mounted on the circuit board and having contacts movable into and out of contact with the stationary contacts, and a plurality of electronic parts mounted on the circuit board via the holder.

In summary, a mounting structure for an electronic apparatus includes a single holder including a key sheet portion to be mounted on a circuit board and a plurality of holder portions for holding electronic parts. The structure therefore reduces the number of parts to be mounted to the circuit board and thereby enhances efficient assembly of the apparatus.

Various modifications will become possible for those skilled in the art after receiving the teachings of the present disclosure without departing from the scope thereof.

Each feature disclosed in this specification (which term includes the claims) and/or shown in the drawings may be incorporated in the invention independently of other disclosed and/or illustrated features.

Statements in this specification of the "objects of the invention" relate to preferred embodiments of the invention, but not necessarily to all embodiments of the invention falling

within the claims.

The description of the invention with reference to the drawings is by way of example only.



**C L A I M S :-**

1. A device for holding one or more components of an electronic apparatus, said device comprising:  
  
component receiving means for receiving said one or more components; and  
  
a plurality of movable keys for contacting respective contacts formed on a circuit board.
2. A device according to Claim 1 comprising a plurality of contacts formed on said keys for contacting respective contacts formed on the circuit board.
3. A device as claimed in Claim 1 or 2, wherein said keys and component receiving means are formed in a planar arrangement.
4. A device as claimed in any preceding claim, wherein said component receiving means comprises one or more recesses for accommodating respective components.
5. A device as claimed in any preceding claim, wherein said component receiving comprises receiver/transmitter receiving means for receiving at least one of a receiver and a transmitter.
6. A device as claimed in Claim 5, wherein said receiver/transmitter receiving means is formed from material for enhancing an acoustic characteristic of said at least one of a receiver and a transmitter.

7. A device as claimed in any preceding claim, wherein said component receiving means comprises means for receiving a display.

8. A device as claimed in Claim 7, wherein said display receiving means is formed from material substantially transparent to light.

9. A device as claimed in any preceding claim, wherein said keys are formed from elastic material.

10. A device as claimed in Claim 9, wherein said elastic material is substantially transparent to light.

11. A device as claimed in any preceding claim, wherein said keys are formed in a key sheet portion of said device.

12. A device as claimed in Claim 11, wherein said keys comprise a plurality of numeral keys, a call origination key, an off-hook key and an on-hook key.

13. A device as claimed in any preceding claim, formed from one material.

14. A device as claimed in any of Claims 1 to 12, formed from a plurality of different materials.

15. A combination of a device according to any preceding claim and a circuit

board comprising a plurality of contacts.

16. A combination according to Claim 15, wherein said device is mounted on said circuit board.

17. A combination of a device according to Claims 8 and 10, and means for illuminating a display through said display receiving means and said keys.

18. A combination according to Claim 17, wherein said device is mounted on a circuit board, said illuminating means being positioned between the device and the circuit board.

19. Electronic apparatus comprising a device as claimed in any of Claims 1 to 14.

20. Electronic apparatus comprising a combination as claimed in any of Claims 15 to 18.

21. Electronic apparatus according to Claims 19 or 20, comprising a telephone.

22. A telephone according to Claim 21, comprising a transmitter, a receiver and a display each located in said component receiving means.

23. A device for holding one or more components of an electronic apparatus substantially as herein described with reference to and as shown in Figure 1 of the

accompanying drawings.

24. A combination of a device for holding one or more components of an electronic apparatus and a circuit board substantially as herein described with reference to and as shown in Figure 1 of the accompanying drawings.

25. A combination of a device for holding one or more components of an electronic apparatus and illuminating means substantially as herein described with reference to and as shown in Figure 1 of the accompanying drawings.

26. Electronic apparatus substantially as herein described with reference to and as shown in Figure 4 of the accompanying drawings.



Application No: GB 9902526.4  
Claims searched: 1-26

Examiner: Vaughan Phillips  
Date of search: 22 September 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.Q): H1N (NAX, NBG, NBH)

Int CI (Ed.6): H01H

Other:

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	WO 85/03595 A1 (HAYES) see Fig. 1, keyboard 15 receives window 23	1 at least
X	US 5386084 (MORROW) see Fig. 2, cover 22 has opening 16 for display 26	1 at least
X	US 3798639 (EPOCH) see Fig. 2, cover 16 receives cassette 18	1 at least

N	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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